Patent Claims

1. A hydraulic transformer having a housing (24) and having an expeller part (25) in which a plurality of expellers (31, 62, 72) which bound expeller spaces with variable volumes are guided, a cam part (32, 63, 74, 76) on which the expellers are supported, and having control means, in particular a control cam (40) which has three kidney-shaped control slots (41, 42, 43) via which the expeller spaces (26) can be successively connected to a supply port, to a working port and to a reservoir tank port, characterized in that the control means can be controlled cyclically, in that in particular a control cam (40) or the expeller part (20) can be driven in rotation by means of a drive (44), and in that of the two components comprising the expeller part (25) and cam part (32, 63, 74, 76) one component can move freely with respect to the other component in terms of two rotational or translatory degrees of freedom within a limited range.

2. The hydraulic transformer as claimed in claim 1, characterized in that the control means can be controlled cyclically, in that, in particular, a control cam (40) can be driven in rotation by means of a drive (44), and in that of the two components comprising the expeller part (25) and cam part (32, 63, 74, 76) one component is arranged essentially fixedly with respect to the housing (24) and the other

component can move freely in terms of two rotational or translatory degrees of freedom within a limited range.

3. The hydraulic transformer as claimed in claim 1 or 2, characterized in that the limits of the range within which the other component can move freely are variable.

4. The hydraulic transformer as claimed in claim 1, 2 or 3, characterized in that it is embodied in a design with axial pistons (31) which are located in the expeller part (25), and in that the cam part (32) is a wobble plate which is mounted by means of a universal joint (33) with its center in the center of said wobble plate so as to be capable of pivoting on all sides and can be supported, at a distance from its center, on a stop (35) in a rotational fashion.

5. The hydraulic transformer as claimed in claim 4, characterized in that the stop (35) is steady in the direction of rotation of the wobble plate (32).

6. The hydraulic transformer as claimed in claim 5, characterized in that the abutment between the wobble plate (32) and the stop (35) is linear.

7. The hydraulic transformer as claimed in claim 5 or 6, characterized in that the distance between the center and the rotating support point of the wobble plate (32) is equal to or larger than the distance between the center and the locations where the axial pistons (31) act on the wobble plate (32).

8. The hydraulic transformer as claimed in one of claims 4 to 7, characterized in that the stop (35) for the rotating support point of the wobble plate (32) is located on its rear side facing away from the axial pistons (31).

9. The hydraulic transformer as claimed in one of claims 4 to 7, characterized in that the stop (35) for the rotating support point of the wobble plate (32) is located on its front side facing the axial piston (31).

10. The hydraulic transformer as claimed in claim 4, characterized in that the stop for the wobble plate (32) is implemented by means of a travel movement limitation for the axial pistons (31).

11. The hydraulic transformer as claimed in claim 10, characterized in that the axial pistons (31) and the bores (26) of the expeller part (25) in which the axial pistons (31) are located have faces (47) which correspond to one another, curve in a spherical or circular-cylindrical fashion, lie axially opposite one another and go into an abutting position against one another.

12. The hydraulic transformer as claimed in one of claims 4 to 11, characterized in that the distance between the universal joint (33) and the stop (35) measured in the direction of the central axis (27) of the expeller part (25) is variable.

13. The hydraulic transformer as claimed in claim 12, characterized in that the universal joint (33) can be moved

in the center of the wobble plate (32) on a circular path about a central axis (27) of the expeller part (25), and in that the stop (35) is of shell-shaped design in order to absorb axial and radial forces.

14. The hydraulic transformer as claimed in claim 12, characterized in that the universal joint (33) is arranged fixedly on the central axis (27), and in that a sliding element (55) which bears against the stop (35) in a plane perpendicular to the central axis (27) and which is coupled to the wobble plate (32) by means of a joint whose position rotates with the wobble plate (32) is arranged between the stop (35) and the wobble plate (32).

15. The hydraulic transformer as claimed in one of claims 12 to 14, characterized in that the wobble plate (32) is embodied as a spherical layer which contains a large circle and which is located so as to slide in a sealed fashion in a circular-cylindrical receptacle and is supported in a direction of the expeller part (25), and in that a hydraulic cushion, whose volume is variable, is located on the side of the wobble plate (32) facing away from the expeller part (25).

16. The hydraulic transformer as claimed in one of claims 4 to 14, characterized in that the universal joint (33) is a ball and socket joint, and in that the wobble plate (32) is embodied as a spherical layer with an outer face which lies on a spherical surface, and is held in a recess

(51) with a spherical bearing face.

17. The hydraulic transformer as claimed in claim 16, characterized in that the recess (51) has a negative spherical layer, and in that the wobble plate (32) is supported on the stop (35) on the side facing away from the expeller part (25).

18. The hydraulic transformer as claimed in one of claims 4 to 17, characterized in that the expeller part (25) can be driven in rotation by means of a drive (44), and in that the wobble plate (32) can be entrained by the expeller part (25), preferably by means of the axial pistons (31).

19. The hydraulic transformer as claimed in claim 1, 2 or 3, characterized in that it is embodied with a vane design with a cam ring as cam part (63), having vanes (62) as expellers and having an expeller part (25) which holds the vanes, and in that of the two components comprising the cam ring (63) and expeller part (25) one component is arranged fixedly and the other component is supported radially on the inside or outside of a circular-cylindrical face so as to be movable in a plane perpendicular to the axis of the fixed arranged component.

20. The hydraulic transformer as claimed in claim 19, characterized in that the expeller part (25) can be moved within a circular-cylindrical chamber of the housing (24) which functions as a cam ring (63).

21. The hydraulic transformer as claimed in claim 19, characterized in that the expeller part (25) is the fixedly arranged component, and the cam ring (63) is supported in a movable fashion within the housing (25) and on the inside of the expeller part (25) or on the outside of the housing (24).

22. The hydraulic transformer as claimed in claim 1, 2 or 3, characterized in that it is embodied with a radial piston design with a cam ring (63) as the cam part, with radial pistons (72) to which pressure is applied on the inside, as expellers, and with a fixed expeller part (25) which holds the radial pistons (72), and in that the cam ring (63) can move within the housing (24) and is supported on the inside of the expeller part (25) or on the outside of the housing (24).

23. The hydraulic transformer as claimed in claim 1, 2 or 3, characterized in that it is embodied with a radial piston design with a cam ring (76) or a cam plate (74) as the cam part, with radial pistons (72) to which pressure is applied on the outside, as expellers, and with a fixed expeller part (25) which holds the radial pistons (72), and in that the cam part (74, 76) can move within the expeller part (25) and is supported on the inside or outside as a cam ring (76) and is supported on the outside as a cam plate (74).